Thomas Fire Roads BAER Report

Resource Specialty: Roads / Engineering
Fire Name: Thomas Fire CA-LPF-003616
Month and Year: January 2018
Author(s) Name and Home Unit: Alvin Sarmiento, Civil Engineer Modoc N.F.
Rusty LeBlanc, Civil Engineer Technician Stanislaus N.F. (retired)

Potential Values at Risk

A. Critical Values

a. Human Life and Safety

i. **High Risk** (Possible, Major) – It is likely that storms would provide increased runoff and sediment delivery to various roads within the Thomas Fire due to the moderate to high burn severity in the area. If not mitigated, runoff and sediment delivery to the road prism would cause a safety issue to road users and increase the chance of injury. In the Thomas Fire, National Forest System Road (NFSR) 4N05 (Chismahoo/Superior), 4N10 (Laguna Ridge), 4N15 (Sisar Canyon), 5N12 (East Camino), 5N13 (Matilija/Murietta), 5N42 (Chief Peak), 5N08 (Nordhoff Ridge), and 6N01 (Cherry Canyon) are mainly the roads within the Thomas Fire where there is a risk to life and safety of public, FS personnel, permittees, and other road users.

b. Property

i. **High Risk** (Likely, Moderate) – Property damage to National Forest Service Roads are at high risk from water diversion and loss of road function and access on NFSR 4N05 (Chismahoo/Superior), 5N12 (East Camino), 5N13 (Matilija/Murietta), 5N15 (Romero Camuesa), and 5N16 (Big Caliente). Protection of the culverts and over side drains is necessary to handle the increased runoff and sediment delivery. If not mitigated, the drainage features would not function as intended and caused damage to the road prism. Potential washouts could occur on road segments where there is a lack of drainage structure.

B. **Resource Condition Assessment**

a. **Resource Setting:**

i. Exhibit 1A shows an overview of the burn severity with the roads on the Thomas Fire. National Forest Service System Roads (NFSR) within or adjacent to the Thomas burn perimeter are listed in INFRA as Maintenance Level (ML) 2, 3, 4 and 5. ML 2 are single lane with native surface, and maintained for high clearance vehicles. ML 3 are single lane native surface suitable for passenger cars. Road designs generally include insloped with rolling dips, lead-off ditches, and over side drains to facilitate the drainage of the road. Perennial streams crossing have varying culvert diameters from 18 to 48 inches. Some road segments have a backlog of existing deferred road maintenance and some segments suffered above normal damage from the 2016/17 winter storms. High priority NFS roads include 5N15 (Romero Camuesa) and 5N16 (Big Caliente). The Travel Management MVUM for the Los Padres NF identifies 5N15 and 5N16 as open to highway legal vehicles.

Table 1: NFSR ML miles inside the Burned Perimeter

Maintenance Level	Definition	Miles
5	High Degree of User Comfort	4.9
4	Moderate Degree of User Comfort	8.0
3	Suitable Passenger Car	13.4
2	High Clearance Vehicles	71.0
	Total	**97.3**

Table 2 NFSR Roads Surveyed

Road #	Name	Miles
4N05	Chismahoo / Superior	13.7
4N10	Laguna Ridge	4.3
4N15	Sisar Canyon	7.6
5N08	Nordhoff Ridge	15.3
5N12	East Camino	3.9
5N13	Matilija / Murietta	17.0
5N15	Romero Camuesa	8.9
5N16	Big Caliente	2.0
5N42	Chief Peak	2.8
6N01	Cherry Canyon	1.5
6N31	Sespe Road	4.7
	Total	**81.7**

Table 3 NFSR Roads Proposed For Treatment

Road #	Name	Miles
4N05	Chismahoo/Superior	6.0
5N12	East Camino	0.2
5N13	Matilija/Murietta	11.0
5N15	Romero Camuesa	4.0
5N16	Big Caliente	2.2
	TOTAL	**23.4**

Table 4 NFSR Roads not Surveyed

Road #	Name	Miles
5N11	Gridley Canyon	1.0
5N34	Cozy Del	4.4
4N06	Rice Wills	4.1
5N05	Howard Creek	1.2
4N04A	La Broche Canyon	2.7

b. Findings of the On-The-Ground Survey:

i. The Thomas Fire ignited as part of multiple wildfires in Southern California totaling approximately 281,893 acres, becoming the largest wildfire in modern California history. On the ground reconnaissance of roads within and adjacent to the fire perimeter were assessed by BAER Team road engineers to determine if there were any values at risk (VAR) related to life and safety, property, and other resource values. In addition, the roads are assessed to determine which have the highest potential for water diversion and fire related flood damages. It was determined that there is risk to life and safety along NFSR 4N05 (Chismahoo/Superior), 4N10 (Laguna Ridge), 4N15 (Sisar Canyon), 5N12 (East Camino), 5N13 (Matilija/Murietta), 5N42 (Chief Peak), 5N08 (Nordhoff Ridge), and 6N01 (Cherry Canyon). NFSR 4N05 (Chismahoo/Superior), 5N12 (East Camino), 5N13 (Matilija/Murietta), 5N15 (Romero Camuesa), and 5N16 (Big Caliente) had a potential risk to property damage and loss.

c. Consequences of the Fire on Values at Risk

i. **Life and Safety:** As a result of the burned watersheds it was determined through the BAER Risk Assessment process that it is likely that the burned hill sides above some road segments pose a risk to road users from hazard trees, rock fall, flash flooding, debris and sediment flows, resulting in hazards to road users from the potential loss of road function, denial of access, and entrapment. The magnitude of this occurrence has major consequences and is considered a high risk to life and safety of road users of the Thomas Fire area including NFSR 4N05 (Chismahoo/Superior), 4N10 (Laguna Ridge), 4N15 (Sisar Canyon), 5N12 (East Camino), 5N13 (Matilija/Murietta), 5N42 (Chief Peak), 5N08 (Nordhoff Ridge), and 6N01 (Cherry Canyon).

ii. **Property:** It has been determined through the BAER Risk Assessment process that it is likely with moderate consequences that post burn conditions in the Thomas Fire area will increase runoff and the movement of sediment and debris into some road drainage features, such as culvert inlets, over side drains, roadside drainage ditches, roadway dips, and runouts along segments of NFSR 4N05 (Chismahoo/Superior), 5N12 (East Camino), 5N13 (Matilija/Murietta), 5N15 (Romero Camuesa), and 5N16 (Big Caliente). The magnitude of this occurrence is considered to be high and puts property (roads) at risk for blockage and uncontrolled water to divert, resulting in likely damage to the invested road improvements, loss of road function and denial of access.

iii. **Resource Values / Cultural Resources:** Archaeological surveys adjacent to roads within the burn perimeter identified several potential sites. The anticipated road related flooding, debris flows and rock fall would not impact these sites according to BAER Team Archeologist.

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BAER Risk Assessment Refer to: Chapter 2520 - Watershed Protection and Management

Probability of Damage or Loss	**Magnitude of Consequences**		
	Major	Moderate	Minor
	RISK		
Very Likely	**Very High**	**Very High**	**Low**
Likely	**Very High**	**High**	**Low**
Possible	**High**	**Intermediate**	**Low**
Unlikely	**Intermediate**	**Low**	**Very Low**

Value (Life/Property/ Resources)	**Value At Risk**	**Probability of Damage or Loss**	**Magnitude of Consequences**	**Risk**	**Types of Treatments**
• Life and Safety, Risk to post-fire Road users	NFSR 4N05 4N10 4N15 5N12 5N13 5N42 5N08 6N01	Possible – Rock fall, debris, and sediment flow	Major	High	Install BAER Warning and Information Signs Install gates, keep gates closed Flash Flood Signs
• Property, Road Investment	NFSR 4N05 5N12 5N13 5N16	Likely – water diversion	Moderate	High	Restore Drainage Function Critical Dips Culvert Risers Drainage Armoring Channel excavation upstream of culverts

C. **Emergency Determination**

This assessment determines an emergency situation and identifies risks to the road system and adjacent resources based on the likelihood of the following threats.

i. **Life and safety** – Forest Service personnel, permittees and other road users. Rock fall, debris and sediment flows from burned hill slopes above some road segments pose a major risk to road users resulting in the loss of road function, denial of access and entrapment.

ii. **Property** – Risk to invested road improvements with major consequences due to the loss of control of water from blocked or plugged drainage features causing water to divert away from intended drainage courses such as culvert crossings, roadside ditch lines and runout ditches, resulting in roadway damage, loss of road function and denial of access.

iii. **Cultural resources** – The determination was made that road related flooding, rock fall and debris flow would not be a risk to cultural resources.

D. Treatments to Mitigate the Emergency:

a. Safety and Protection

i. Treatments to mitigate the risks to life and safety is administrative closure by order of the fire area. Treatments include utilizing existing closure gates, installing road closure signs post-fire the first season, installing BAER warning and information signs to replace closure signs at main entry points once the fire area is reopened to the public; close existing gates post-burn operation; inspect roads in the spring before opening respond accordingly to road damage and public safety concerns; patrol and maintained closure signs at main entry points the first season; patrol and maintain BAER warning and information signs at main entry points once the administrative closure is lifted and the public access is allowed.

ii. Closure Gates: Main entry points accessing the fire area have existing gates across forest roads. Several of these existing gates will require re-signing to MUTCD standards.

iii. Signs: The following locations were identified as a signage strategy for main entry points of the Thomas Fire:

1. Chismahoo/Superior road west end of NFSR 4N05 at MP-0.3 from the intersection with HWY 150
2. Chismahoo/Superior road east end of NFSR 4N05 at the existing gate MP-1.2 from the intersection with HWY 150
3. Laguna Ridge NFSR 4N10 at the existing gate near the intersection with HWY 150
4. Sisar Canyon NFSR 4N15 forest boundary at the existing gate MP-0.5 from the intersection with HWY 150
5. East Camino NFSR 5N12 and 5N13 end of pavement at the existing gate MP-6.3 from the intersection with Camino Cielo road
6. Matilija/Murietta NFSR 5N13 at the existing gate MP-4.6 from the intersection with HWY 33

7. Chief Peak NFSR 5N42 at the existing gate MP-3.3 miles from the intersection with HWY 33
8. Cherry Canyon NFSR 6N01 at the existing gate near the intersection with HWY 33.
9. 12 flash flood signs at low water crossings identified in the hydrology BAER specialist report.

b. **Property**

i. It has been determined through the BAER Risk Assessment process that it is likely that post-burn conditions in the Thomas fire area will increase runoff and the movement of sediment into some road drainage features, such as culvert inlets, over side drains, roadside ditch lines, roadway dips and runouts, along certain segments of NFSR 4N05 (Chismahoo/Superior), 5N12 (East Camino), 5N13 (Mitilija/Murietta), 5N15 (Romero Camuesa), and 5N16 (Big Caliente). The magnitude of this occurrence is considered moderate and puts property (roads) at risk for blockage and uncontrolled water to divert, resulting in likely damage to the invested road improvements, and a risk to road users. Accepted and economical BAER road treatments to mitigate the risk to property including restoring drainage function (storm proofing), constructing roadway relief dips down grade of culvert crossings (critical dips), installing vertical riser pipes on culvert inlets (snorkels), fill slope and critical dip protection installing rip/rap rock (drainage armor), and channel excavation upstream of culverts. These proposed road treatments will help storm proof and prepare the roads for the winter season. Storm inspection and response will monitor accomplished road treatments and assure access.

ii. Resource Values / Cultural Resources

1. Archaeological surveys identified several sites in the Thomas Fire area. There is no recommendation to mitigate road related effects to these sites.

iii. **Accepted and economical BAER road treatments:**

1. Install BAER warning and Information signs
2. Install Road Closure and Information signs
3. Channel Clearing (excavation)
4. Install Critical dips with drainage armor
5. Install culvert inlet modification (Risers)
6. Restore Drainage function (storm proofing)
7. Storm inspection and response (storm patrol)

***Appendix – C** of this report provides detailed road specifications and treatment locations.

(i) Treatment Type – BAER road treatments as described but not limited to chapter 4 and 5 BAER catalog.

Treatment Objective – mitigate risks to life and safety and the invested Los Padres National Forest road improvements.

Treatment Description – Install accepted and economical BAER road treatments as described above and outlined in chapter 4 and 5 of the BAER catalog.

Treatment Cost – Estimated Treatment Cost by Road

Road #
4N05 Chismahoo/Superior
5N12 East Camino
5N13 Matilija/Murietta
5N15 Romero Camuesa
5N16 Big Caliente
Cost Estimate
Contract prep, administration, and implementation at 25%
Total Treatment Cost

***Road treatment cost do not include safety and protection (signs)

Cost Benefit Matrix

Appendix – D of this report includes the detailed cost break down of proposed road Treatments.

The proposed BAER road treatments are suitable for either force account road crews or private contractors. The probability of completing treatment in first year prior to damaging storms or events is considered to be high and achievable.

The proposed BAER road treatments will restore the function of drainage features, storm inspection and response will inspect and respond. The proposed road treatments are considered to be at the 80 to 90 percent success rate.

Discussion/Summary/ Recommendation

Implement BAER road treatments before the first damaging storm events of the season

B. Santa Barbara and Ojai Ranger District – coordinate closure gate locations, and BAER warning sign wording and exact locations.

Contacts and References

- INFRA Travel Routes Inventory, and Quad Maps.
- Federal standards for the construction of Roads and Bridges.
- BAER Catalog (chapter 4 and 5)
- BAER Team meetings and discussions.

Exhibits and Appendices

Exhibit 1 – Thomas Fire Road Treatment Map with Burn Severity
A. Thomas Fire Photo Log
B. Thomas Fire Benefit/Cost Analysis
C. Road treatment specifications and locations.
D. Safety and Protections and Road Treatment Cost Table
E. Thomas Fire BAER VAR Matrix